23PPH22 — QUANTUM MECHANICS – I

Time : Three hours   Maximum : 75 marks

PART A — $(10 \times 2 = 20$ marks)

Answer ALL questions.

1. State Hermitian operator.

2. What does uncertainty relation mean?

3. Define alpha emission.

4. Write down the equation for system of two interacting particle.

5. What is mean by coordinate representation?

6. Define the term "unitary transformation".

7. State stark effect.

8. Write down any two applications of Simple Harmonic oscillator.

9. Define the term "Ladder operator".

10. What is mean by symmetry and antisymmetric of wave function?

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PART B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Derive the expression for time independent Schrodinger equation.

Or

(b) Write a short note on postulates of Quantum mechanics.

12. (a) Explain in details Square well potential barrier.

Or

(b) Explain rigid rotator.

13. (a) Derive an equation of motion in Heisenberg representation.

Or

(b) Explain in detail about unitary transformation.

14. (a) Obtain the expression for stark effect in hydrogen atom.

Or

(b) Give the simple derivation of WKB Quantization.

15. (a) Derive the matrix for Lx, Ly and Lz.

Or

(b) Explain Pauli's exclusion principle.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive the expression for Ehrenfest's theorem.

17. Deduce the particle moving in a spherically symmetric potential.

18. Derive the equation of motion in Schrodinger representation.

19. Apply variation method of ground state energy of the hydrogen atom and obtain the minimum energy.

20. Find out the C. G coefficients for $j_1 = j_2 = 1/2$.

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